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Coast Range and Cascades: major patterns by geomorphic group

There are many similarities between riparian communities in the NW Oregon Coast Range and in the westside Cascades. The following discussion follows the geomorphic structure of the guide to bring out some major patterns. Main geomorphic groups include in-channel (within the normal highwater line), channel margins, cobble bars/active floodplains, and terraces/steep banks. This progression goes from the geomorphic surfaces with the most frequent flood effects, least developed soil, and herb dominated communities through shrub dominated communities with shallow soils subject to periodic flooding, to tree dominated terraces or steep slopes seldom directly affected by floodwaters.

The Cascades are mainly volcanic basalts and andesites, and bear the imprint of glaciation. Pleistocene terraces can be identified in many drainages, and boulders from ice age torrents are features of streams now too gentle to be able to carry them. Most drainages are dominated by boulders and cobbles. High elevation snowpacks moderate water levels during the winter, and release water longer into the spring. Lower elevation basins respond more directly to rain patterns and may peak during the winter, with high flow more confined to high precipitation months than creeks with high elevation headwaters.

The Coast Range is dominantly sandstone and escaped major glaciation. Rock weathers more quickly than in the Cascades. Boulders are scarce; bedrock channels are common. Persistent snow pack is nearly absent. Coast Range streams tend to respond quickly to rainfall, and peak during winter months. Extremely high rainfall on the coastal side of the mountains means that very large volumes of water pass through lower sideslopes and toeslopes. Such moist conditions blur the distinction between riparian and upland communities in the transition zone between creek and upslope. Salmonberry, generally confined to near-creek environments in the Cascades and foothills, is a dominant upland understory shrub following disturbance in much of the Coast Range. Rainshadow effects in the eastern Coast Range confine salmonberry to near-Cascadian patterns near the Willamette Valley. (For another approach to geomorphology and riparian understory vegetation distribution in the Coast Range, see Pabst and Spies 1998).

In-channel

Communities in this group are found on surfaces that are flooded much of the rainy season. These can be in pockets of sand or soil tucked into crevices of boulders or cobbles, or on sandy gravel/cobble depositional bars or islands.

Watercarpet is adapted to in-channel bars or channel margins.

Community members are generally 1) species that are tolerant of intermittent flooding or temporary standing water (water-parsley, watercarpet, willow), 2) opportunistic species that can take advantage of the site after the water level drops in the spring such as grasses and a host of weeds (native and exotic), and 3) species that adapted to dispersal by flood and sprout readily from pieces deposited on cobble bars (willow, coltsfoot, trillium-leaved sorrel, horsetail).

Some specially adapted species such as cold-water corydalis which seem to require cold temperature water may be found on these surfaces in spring-fed creeks from the High Cascades.

Cobble/boulder communities (Streambank springbeauty, Yellow monkeyflower) are more common in the Cascades, while in-channel communities in the Coast Range most often represent the semi-submerged grassy, weedy sandy gravel/cobble bar types. Coltsfoot dominates somewhat similar gravel/cobble bars in the Cascades. Coltsfoot appears to be much more common in the Cascades than the Coast Range.

Channel margin

Coltsfoot on the channel margin

Channel margins include surfaces that are affected by annual high water, with little soil development, and shallow water table. Communities are mainly herbaceous, but shrubs may be present though not abundant. These geomorphic surfaces are similar to in-channel surfaces, but they are inundated less and tend to have slightly more fines available for rooting. In the Cascades, Coltsfoot-Cooley's betony is very common. Sorrel and piggyback plant begin to appear, though at low cover. Those two species become more important in floodplains or moist terraces and mark deeper accumulation of organic matter and fines. Saxifrages (*Boykinia, Mitella, Tolmeia, Tiarella*) are major components of channel margin as well as active floodplain communities.

In the Coast Range, Stink currant-salmonberry/watercarpet is the first of the shrubby stink currant-salmonberry communities so typical of shallow soils over cobbles. In this community, the watercarpet and water-parsley indicate that these channel margins are frequently inundated into the growing season. In the Cascades, Stink currant/coltsfoot plays a parallel role as the transition to the next set of geomorphic surfaces: cobble bars/active floodplains.

Water-parsley occurs on frequently inundated surfaces.

Cobble bars/active floodplains

These geomorphic surfaces are subject to the larger annual high water events. These sites generally have deeper accumulation of fines and organic matter, though still are shallow over coarse substrate. Water tables are fairly near the surface. Shrub communities dominate. In low- to mid-elevations, Stink currant-salmonberry communities are most common in coarser, shallower soil and lower surfaces. Salmonberry occuring without much stink currant often signals deeper fines and higher organic matter, and more distance from the stream. Piggyback plant, trillium-leaved sorrel, and lady fern are typically dominants. Sword fern is present though at low cover on surfaces transitioning to elevated floodplains/terraces. Higher proportion of sorrel compared to piggyback plant tends to indicate higher silt content in upper horizons.

Stink currant with young alder

In the Cascades higher elevation riparian areas, these surfaces may support Sitka alder or Oval-leaved huckleberry communities with a suite of species largely absent in the generally lower elevation Coast Range drainages.

Salmonberry and stink currant communities are comparable in the two mountain ranges. However, the Coast Range communities consistently show 10-20% higher salmonberry cover for similar types, though stink currant cover is generally equivalent. The Coast Range also tends to have more abundant sorrel and sword fern than in parallel types in the Cascades. Perhaps the most similar communities are the Cascadian Stink currant-salmonberry/foamflower-oval-leaved mitrewort and the Coastal

Salmonberry-stink currant/foamflower communities. However, the Cascades type has lower salmonberry cover and higher foamflower constancy. The Coast type has soils which tend to be finer and deeper, with more silt and less sand. This difference in soils is fairly typical for most Cascades/Coast Range shrub community comparisons.

Terraces/steep slopes

Terraces, steep banks and lower valley walls are only subject to re-set by floods during infrequent major events. Most communities are tree-dominated, reflecting lower flood frequency and deeper, better drained soils. Trees often show multiple age cohorts which suggest repeated flooding that doesn't necessarily remove all of the existing stand. Conifers are markedly more common on terraces and steep banks than on geomorphic surfaces closer to channels. In the understory, saxifrages and lady fern become less constant and abundant than on floodplains. Trees tend to be denser and older on terraces than in the same communities present on steeper surfaces.

The Cascadian Salmonberry/sorrel group is floristically similar to the Coastal Salmonberry/sword fern community, but is considerably less shrubby. The Coastal community has higher salmonberry cover, more shrub species overall, and lower lady fern. The Cascadian group also tends to occur somewhat lower and closer to the channel. In the wetter Coast Range environment, this type goes from terraces to valley walls. It seems transitional to the upland rather than hugging the creek. Coastal examples typically are on deeper loams, while the equivalent Cascadian community has shallower, coarser soils.

Distinctive environments in the northeastern Cascade foothills, southwestern Coast Range, and southern Willamette Valley margins create variants on terrace/steep bank communities. Red alder/common snowberry-salmonberry is a minor community from Mt. Hood NF samples that seems to be transitional environmentally to some Willamette Valley common snowberry communities. In the southwestern Coastal Mapleton area, near-coastal evergreen huckleberry

Dense salmonberry is typical of riparian areas in the wetter zones in the Coast Range.

forms a unique combination with warm indicator California hazel and moist indicator salmonberry in the Big leaf maple/California hazel-salmonberry community. The California hazel-vine maple/sorrel community from the South Valley Resource Area in the Coast Range has some similarities to the warm, low elevation Cascadian Forested California hazel/sword fern group. Salmonberry is not a member of this community. Salmonberry is very restricted in that part of the Coast Range rain shadow, though it would be expected on similar surfaces in higher precipitation zones nearby.

Consistently high salmonberry cover in Coast Range communities discourages conifer regeneration. Salmonberry and red alder competition may largely account for low natural conifer density in riparian areas. Seedlings planted for riparian restoration projects are also subject to significant wildlife damage. This may be related to the major wildlife browse noted in many of the communities targeted for restoration plantations.

High terraces/elevated floodplains

Patterns for the two mountain ranges pull apart in this geomorphic group. The geology and landforms diverge, with glaciation as the driving factor. Glaciers in the Cascades created wide U shaped valleys in the upper elevations. Major rivers work their way back and forth across big valleys filled with glacial material. Old Ice Age floodplains have become high terraces that no longer interact with their streams. In many streams, moving channel boulders is beyond the capacity of modern stream flow. Boulder bars and high islands in some streams are functionally upland in character, soil, and community.

In the Coast Range, meanders of many major rivers are incised deeply into bedrock. Channel migration and renewal of fluvial landforms is restricted in the largest systems. The wide elevated valleys have largely been turned to agriculture since settlement from the 1800's to early 1900's, and none were included in the sample.

One further complication for the major rivers draining the western Cascades is the effect of dams on the flood regimes and geomorphic surfaces downstream. Flood levels since the 1960's are lower and less frequent; summer flows are maintained above historical levels. Scour and deposit patterns may be altered. This affects the structure of communities on floodplains and terraces for the larger dammed rivers: the Middle Fork Willamette, McKenzie, North Santiam, South Santiam, Clackamas, and Sandy. Shrubs and trees are likely to survive and grow longer than common under the old flood regime. In such communities, this may be particularly evident in the sizes and ages of conifers such as Douglas fir, grand fir, and incense cedar. Changed competitive relationships among species that can establish and mature under post-flood conditions may result in compositional shifts over time. The same may be expected for the forested communities from the Willamette Valley sampling.

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Non-natives

Reed canarygrass displaced the native community in this Coast Range riparian area.

Riparian areas are vulnerable to invasion by non-natives (Planty-Tabacchi and others 1996), and often show some of the highest numbers of exotic species among neighboring vegetation types. Weeds present in the watershed arrive in riparian areas with water or wind. The exotics may have started in the watershed along roads, homesteads, agricultural fields, or logging units. Many spread from garden debris dumped at a convenient pull-out. Propagules enter stream systems at road crossings, or wash down from ditches. Wildlife using riparian areas can move weeds upstream or downstream. Up-canyon day winds move wind-dispersed seed easily through the open riparian canopy. Down-canyon airflow moves in the late afternoon and evening. Frequent disturbances maintain open niches for the weeds, ready to colonize new sites.

The sample used in the classification was intended to represent unmanaged native communities. Sites dominated by exotics were largely excluded. This was most strictly applied in the Willamette Valley where native communities are rare. Reed canarygrass and the Japanese/giant knotweeds were generally so dominant that most plots with those species were dropped from the analysis. Even with a systematic bias against non-native species, the proportions of plots with exotics were high: Coast Range 35%, Cascades 35%, and Willamette Valley 13%.

Open, sunny sand bar provides a fresh seedbed for many non-natives.

Another factor reducing the number and amount of non-native species recorded is that sampling extended from 1990 to 2001. A number of species (e.g. Japanese knotweed, giant knotweed, common foxglove) are known to be extending their range. Older data may not represent current distribution. As existing non-natives expand and new species are introduced, the impact of exotics in riparian communities throughout Northwest Oregon can be expected to increase.

The following table lists the most common non-native species and the number of plots they were found in by region. Since these sites were chosen to represent native communities, the distribution and abundance of non-native species in the overall managed landscape is underestimated. Wall lettuce is present in 29% of the Cascades plots. Common foxglove was found on 20% of Coast plots and 3% of Cascades plots. Creeping buttercup was far more widespread in the Coastal sample, while common St. John's-wort was more important in the Cascades plots. Rough bluegrass and common velvet-grass were common in the Coast, but minor in the Cascades.

EXOTIC	COMMON NAME	Coast (147 plots)	Cascades (425 plots)	Willamette Valley (95 plots)
Digitalis purpurea	*Common foxglove*	30	14	0
Holcus lanatus	*Common velvet-grass*	13	2	0
Hypericum perforatum	*Common St.John's-wort*	0	10	0
Lactuca muralis	*Wall lettuce*	6	122	0
Poa trivialis	*Rough bluegrass*	14	5	3
Ranunculus repens var. repens	*Creeping buttercup*	13	0	2
Rumex obtusifolius	*Bitter dock*	7	1	0
Senecio jacobaea	*Tansy ragwort*	8	2	0

The giant invasive knotweeds in the Pacific Northwest include Japanese knotweed (*Polygonum cuspidatum*), giant knotweed (*P. sachalinense*), and Himalayan knotweed (*P. polystachyum*), as well as hybrids.

Although minor patches were present in local stream systems before the 1996 flood, the rapid spread after the floods has alarmed many land managers and watershed councils. The giant knotweeds out-compete local dominants such as salmonberry to form near monocultures. Even aggressive non-natives such as Himalayan blackberry can be displaced by the tenacious knotweed.

Japanese knotweed canes grow to 12 feet height. They die back during the winter, exposing surfaces to erosion.
Photo: courtesy of The Nature Conservancy

Beaver-cutting of the invasive knotweed sprouts where it lodges on a gravel bar downstream.
Photo: courtesy of The Nature Conservancy

Invasive knotweed occupies both banks of the Nehalem River (2003).
Photo: courtesy of The Nature Conservancy